

Course Syllabus for ME 520, Advanced Fluid Mechanics I, Fall 2008

Prerequisites: an undergraduate course in fluid mechanics, **vector calculus!**

Room/Time: 2211 GGBL, 10:30-noon, Tuesdays & Thursdays

Instructor: David R. Dowling, Professor drd@umich.edu
 2212 G.G. Brown Laboratory (734) 936-0423
 Office hours: Tuesdays and Wednesdays 3-5 PM

Objective: Prepare the participants for research and engineering involving fluid mechanics.

Textbook: P.K. Kundu, and I.M. Cohen, Fluid Mechanics, 4th Ed., (Elsevier, 2008).

References: G. K. Batchelor, An Intro. to Fluid Dynamics, (Cambridge U. Press, 1967).
 I. G. Currie, Fundamental Mechanics of Fluids, (McGraw-Hill, 1993).
 R.W. Fox et al., Introduction to Fluid Mechanics, 6th Ed. (Wiley, 2006)
 L. D. Landau and E. M. Lifshitz, Fluid Mechanics, (Pergamon, 1959).
 R. L. Panton, Incompressible Flow, (Wiley Interscience, 1984).
 M. C. Potter, and J. F. Foss, Fluid Mechanics, (Great Lakes Press, 1982).
 F. S. Sherman, Viscous Flow, (McGraw Hill, 1990).
 P. A. Thompson, Compressible-Fluid Dynamics, (McGraw-Hill, 1972).
 M. Van Dyke, An Album of Fluid Motion, (Parabolic Press, 1982).
 F. M. White, Viscous Fluid Flow, 3rd Ed., (McGraw-Hill, 2005).
 C.-S. Yih, Fluid Mechanics, (West River Press, corrected edition, 1979).

Website: Available to class participants at: <https://ctools.umich.edu/portal>

Grading:

HW (20%)	<i>Due at lecture on Thursday</i> , 12 assignments, 11 required
Midterm #1 (20%)	Thursday, October 9, 2008, at regular lecture time
Midterm #2 (20%)	Tuesday, November 25, 2008, at regular lecture time
Final (40%)	Tuesday, December 16, 2008, 4:00 – 6:00 PM.

Rules:

- Make-up exams will not be given.
- One book, a dictionary, a calculator, class notes, HW, HW solutions, and a crib sheet may be used on the exams (no other devices, books, or materials allowed).
- Bluebooks are required for all exams.
- The UM CoE honor code will be in effect throughout the course.
- Written regrading requests will be accepted up to one week after exams and homeworks are returned.
- Intellectual collaboration on homework is encouraged. Outright copying is not.
- Lecture notes will not be provided to individual students by the instructor.
- ***All dates and times listed above are subject to change based on a vote of the class and the availability of resources.***

Outline: Topic

- I. Introduction & Background (1 week, Ch. 1, 2, 3 + handouts)
 math tools, vector-derivatives, notation, continuum approx., kinematics
- II. Conservation Laws (6 weeks, Ch. 4, 8 + handouts)
 dimensional analysis, control volumes, differential equations
- III. Perfect Incompressible Fluid Flow (2 weeks, Ch. 6 + handouts)
- IV. Viscous Incompressible Fluid Flow (3 weeks, Ch. 9, 10)
- V. Turbulent Flow (2 weeks, Ch. 13)